

WHAT IS CLAIMED IS:

1. The method to generate test sequences for communication protocols, the method comprising:

the step of inputting the specification in which the data of the finite state machines (FSM) representing the specification of the communication protocols is inputted;

the step of converting the test sequence generation problem which converts the test sequence generation problem to the SAT problem; and

the step of generating test sequences for communication protocols in which the SAT problem is solved and the test sequences for communication protocols are generated.

2. The method to generate test sequences for communication protocols set forth in claim 1 wherein the test sequence generation problem is the problem which generates test sequences to check whether the states described in the specification of communication protocols exist in the implementation of the FSM.

3. The method to generate test sequences for communication protocols set forth in claim 1 wherein the test sequence generation problem is the problem which generates test sequences to check whether the state transitions described in the specification of communication protocols are correctly implemented in the implementation of the FSM.

4. The method to generate test sequences for communication protocols set forth in claim 1 or claim 2 or claim 3 wherein the step of converting the test sequence generation problem is comprising:

the step of modifying the FSM; and
the step of representing the test sequence generation problem by a conjunctive normal form formula based on the modified FSM.

5. The method to generate test sequences for communication protocols set forth in claim 2 wherein the step of converting the test sequence generation problem is comprising:

the step of modifying the FSM; and
the step of representing the test sequence generation problem by a conjunctive normal form formula based on the modified FSM;

and the step of modifying the FSM is comprising the step of adding the state corresponding to the UIO sequence of the each state in the FSM to be checked and the state transitions of the state to the FSM.

6. The method to generate test sequences for communication protocols set forth in

claim 5 wherein the state corresponding to the UIO sequence of the each state in the FSM to be checked is the state which has the same input transitions as the input transitions of the starting state of the UIO sequence of the state to be checked and has the same output transitions as the output transitions of the destination state of the UIO sequence of the state to be checked.

7. The method to generate test sequences for communication protocols set forth in claim 3 wherein the step of converting the test sequence generation problem is comprising:

the step of modifying the FSM; and

the step of representing the test sequence generation problem by a conjunctive normal form formula based on the modified FSM;

and the step of modifying the FSM is comprising the step of adding the state corresponding to the subsequence of the state transitions in the FSM to be checked to the FSM.

8. The method to generate test sequences for communication protocols set forth in claim 7 wherein the state corresponding to the subsequence of the state transitions in the FSM to be checked is the state which has the same input transitions as the input transitions of the starting state of the subsequence of the state transition to be checked and which has the same output transitions as the output transitions of the destination state of the subsequence.

9. The apparatus to generate test sequences for communication protocols, the apparatus comprising:

the section of inputting the specification which input the data of the finite state machines (FSM) representing the specification of the communication protocols;

the section of converting the test sequence generation problem which converts the test sequence generation problem to the SAT problem; and

the section of generating test sequences for communication protocols which solves the SAT problem and generates the test sequences for communication protocols.

10. The apparatus to generate test sequences for communication protocols set forth in claim 9 wherein the test sequence generation problem is the

problem which generates test sequences to check whether the states described in the specification of communication protocols exist in the implementation of the FSM.

11. The apparatus to generate test sequences for communication protocols set forth in claim 9 wherein the test sequence generation problem is the problem which generates test sequences to check whether the state transitions described in the specification of communication protocols are correctly implemented in the implementation of the FSM.

12. The apparatus to generate test sequences for communication protocols set forth in claim 9 or claim 10 or claim 11 wherein the section of converting the test sequence generation problem is comprising:

- the section of modifying the FSM which modifies the FSM; and
- the section of formulating a conjunctive normal form formula which describes the test sequence generation problem by using a conjunctive normal form formula based on the modified FSM.

13. The apparatus to generate test sequences for communication protocols set forth in claim 10 wherein the section of converting the test sequence generation problem is comprising:

- the section of modifying the FSM which modifies the FSM; and
- the section of formulating a conjunctive normal form formula which describes the test sequence generation problem by using a conjunctive normal form formula based on the modified FSM;

- and the section of modifying the FSM adds the state corresponding to the UIO sequence of the each state in the FSM to be checked and the state

transitions of the state to the FSM.

14. The apparatus to generate test sequences for communication protocols set forth in claim 13 wherein the state corresponding to the UIO sequence of the each state in the FSM to be checked is the state which has the same input transitions as the input transitions of the starting state of the UIO sequence of the state to be checked and has the same output transitions as the output transitions of the destination state of the UIO sequence of the state to be checked.

15. The apparatus to generate test sequences for communication protocols set forth in claim 11 wherein the section of converting the test sequence generation problem is comprising:

the section of modifying the FSM which modifies the FSM; and

the section of formulating a conjunctive normal form formula which describes the test sequence generation problem by using a conjunctive normal form formula based on the modified FSM;

and the section of modifying the FSM adds the state corresponding to the subsequence of the state transitions in the FSM to be checked to the FSM.

16. The apparatus to generate test sequences for communication protocols set forth in claim 15 wherein the state corresponding to the subsequence of the state transitions in the FSM to be checked is the state which has the same input transitions as the input transitions of the starting state of the subsequence of the state transition to be checked and which has the same output transitions as the output transitions of the destination state of the subsequence.